SOURCE EMISSIONS COMPARISON (*Draft - do not cite or distribute*)

M. Williams 11/27/01

Source	Baseline Emissions Comparison				Current Emissions Comparison				Increment Consuming Emissions Comparison			
	24-hr EPA[1] [lb/hr]	24-hr ND[2] [lb/hr]	annual EPA [TPY]	annual ND [TPY]	24-hr EPA[3] [lb/hr]	24-hr ND[4] [lb/hr]	annual EPA [TPY]	annual ND [TPY]	24-hour EPA [lb/hr]	24-hr ND [lb/hr]	annual EPA [TPY]	annual ND [TPY]
Basin Electric Power Cooperative - Antelope Valley Station												
Units 1+2	n/a	n/a	n/a	n/a	3598	3845	14282	16841	3598	3845	14282	16841
Otter Tail - Coyote Station												
Unit 1	n/a	n/a	n/a	n/a	5077	5335	17281	23367	5077	5335	17381	23367
Coal Creek Station												
Unit 1[5]	n/a	n/a	n/a	n/a	4195	6336	14332	55503 (unit 1+2)	4195	6336	14332	55503 (unit 1+2)
Unit 2[5]	n/a	n/a	n/a	n/a	3552	6336	12817		3552	6336	12817	
Minnkota Power Cooperative - M.R. Young Station												
Unit 1	3972	7500	13383	13109	5587	7500	18788	32850	1615	0	5405	0
Unit 2[6]	5635	5635	24682	24682	6125	5635	21499	24682	490	0	0	0
Basin Electric Power Cooperative - Leland Olds												
Unit 1	2499	4774	8551	8551	4928	6930	16833	30353	2429	2156	8282	2715
Unit 2	4305	9968	13094	13094	10079	13668	30947	59866	5774	3700	17853	10648
Montana Dakota Utilities Co. - Heskett Station												
Unit 1[7]	602	858	1768	1769	348	1163	1022	13003 (unit 1+2)	-254	0	-746	0
Unit 2	1749	2014	4186	4187	831	1806	1993		-918	0	-2193	0
Great River Energy - Stanton Station												
Unit 1[8]	2310	4416	7176	8018	2447	4416 (units 1+10)	7629	19342 (units 1+10)	137	0	453	0
Unit 10	n/a	n/a	n/a	n/a	317		1107		317	0	1107	0
TOTAL[9]	**21096**	**35189**	**72840**	**73410**	**47108**	**62994**	**158528**	**275807**	**26036**	**27732**	**88972**	**109074**

1. Annual numbers are based on the Annual Emission Inventory Reports from 1976-1977 (e.g., *avg* S, annual coal use) and AP-42 emission factors. 24-hr numbers are based on the ratio of the annual average emission rate (from 1999-2000 CEM data) to the 90th percentile 24-hr emission rate (from 1999-2000 CEM data) applied to the annual average emission rate in the base year.

2. Annual numbers are based on the Annual Emission Inventory Reports from 1974-1977 (e.g., *avg* S, annual coal use) and AP-42 emission factors. 24-hr numbers are based on Annual Emission Inventory Reports from 1974-1977 (e.g., *max* S, *max* hourly coal feed rates) and AP-42 emission factors.

3. Based on the 90th percentile of the 24-hr average from 1999 and 2000 CEM data.

4. Based on "current emissions" for the State's 1999 draft modeling analysis (*i.e.*, 1997-1998?)

5. Based on 2000 CEM data only.

7. Current year emissions based on 2000 CEM data only. Unit 1 does not report to the Acid Rain Database; hourly CEM data were only available for 2000 from the State. 1999 emissions were 813.5 TPY (based on Annual Emission Inventory Report).

6. Unit 2 had only been operating 9 months as of the minor source baseline date (12/19/77) and those 9 months were not considered representative of actual operation. Therefore, allowable emissions were used to determine baseline emissions. See 45 FR 52718, col 3.

8. North Dakota modeled a 3-hr emission rate for the "current emissions" of 5785 lb/hr.

9. The 24-hr increment consuming value that ND used resulted in a high 2nd-high concentration of 12.7 $\mu g/m^3$ in their draft modeling analysis. An estimated 70,000 TPY reduction would be needed to stay within the allowable 5 $\mu g/m^3$ 24-hr increment for Class I areas.

ND SO_2 BASELINE EMISSIONS - based on AP-42 and annual emission inventory reports provided by ND for 1977-1978

SO_2 minor source baseline date for Montana Class I areas = March 26, 1979 *M. Williams 01/04/02*

Source	Date	Controls	Basis	Emission Factor[1] [lb_{SO2}/ton_{coal}]	1977 Actual Emissions				1978 Actual Emissions				**Baseline Emissions**	
					avg. S [%]	avg. coal heat content [Btu/lb]	coal burned [TPY]	annual emissions [TPY]	avg. S [%]	avg. coal heat content [Btu/lb]	coal burned [TPY]	annual emissions [TPY]	**annual [TPY]**	**24-hr[2] [lb/hr]**
Minnkota Power Cooperative - Milton R. Young														
Unit 1	1970	n/a	SIP	30(S)	0.63	6478	1527511	14435	0.65		1427485	13918	**14176**	**4208**
Unit 2[3]	1974	44%-dry alkali FGD	NSPS	1.2 lb/mmBtu	n/a	n/a	n/a	24682	0.65	6427	1956191	15087	**19884**	**4970**
Basin Electric Power Cooperative - Leland Olds														
Unit 1	1966	n/a	SIP	30(S)	0.44	6617	1306785	8625	0.74		1361539	15113	**11869**	**3469**
Unit 2	1971	n/a	SIP	30(S)	0.44	6617	1964660	12967	0.74		2435160	27030	**19999**	**6575**
Montana-Dakota Utilities Co. - Heskett														
Unit 1	1954	n/a	SIP	30(S)	0.68	6958	171162	1746	0.71		161755	1723	**1734**	**590**
Unit 2	1963	n/a[4]	SIP	30(S)	0.68	6958	406145	4143	0.71		342560	3648	**3895**	**1628**
Great River Energy - Stanton														
Unit 1	1966	n/a	SIP	30(S)	0.64	6814	737106	7076	0.61		577004	5280	**6178**	**1989**

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1 AP-42 emission factor of 30(S) is used for uncontrolled cyclone-fired lignite combustion (Table 1.7-1)
AP-42 emission factor of 16.8(S) is used for Subpart D boilers (Table 1.7-2)

2 Based on the ratio of annual average emission rate (from 1999-2000 CEM data) to the 90th percentile 24-hr emission rate (from 1999-2000 CEM data) applied to the annual average emission rate in the base year.

3 Unit 2 had only been operating 9 months in 1977 and those 9 months were not considered representative of actual operation. Therefore, allowable emissions were used to determine 1977 emissions. See 45 FR 52718, col. 3. 1978 emissions are based on an emission limit of 1.2 lb_{SO2}/mmBtu for NSPS boilers (see 40 CFR Part 60 Subpart D).

4 Retrofitted to a fluidized bed combustor in 1987.

6/27/01 - MMW

MINNKOTA BASELINE EMISSIONS - based on annual emission inventory reports provided by ND for Unit 1 and plant-wide consumption data from DOE.

Source	Date	Controls	Basis	Emission Factor[1]	1976 Actual Emissions				1977 Actual Emissions				Baseline Emissions	
					avg. S [%]	avg. coal heat content [Btu/lb]	coal burned [TPY]	annual emiss. [TPY]	avg. S [%]	avg. coal heat content [Btu/lb]	coal burned [TPY]	annual emiss. [TPY]	annual [TPY]	ND model [TPY]
Option 1: Using Coal Consumption Data from DOE for 1977 (first year of operation for Unit 2) only														
Unit 1	1970	n/a	SIP	30(S)	0.52	6367	1581000	12332	0.63	6478	1527511	14435	**13383**	**13109**
Unit 2	1974	44%-dry alkali FGD	NSPS	1.2 lb/mmBtu or 16.8(S)	0.52	6367	not in operation		0.63	6478	873814	6793	**6793**	**24682**

Source	Emission Factor	1978 Actual Emissions			1979 Actual Emissions			1980 Actual Emissions			Baseline Emissions	
		avg. S [%]	coal burned [TPY]	annual emiss. [TPY]	avg. S [%]	coal burned [TPY]	annual emiss. [TPY]	avg. S [%]	coal burned [TPY]	annual emiss. [TPY]	annual [TPY]	ND model [TPY]
Option 2: Using Coal Consumption Data from DOE for 1978-1979 (NOTE: unit-specific coal consumption is not available after 1977)												
Unit 1	30(S)	0.70	3533211	37099	0.69	4040603	41820	n/a	n/a	n/a	**39459**	**37791**
Unit 2												
Option 3: Using Coal Consumption Data from DOE for 1979-1980 (NOTE: unit-specific coal consumption is not available after 1977)												
Unit 1	30(S)	n/a	n/a	n/a	0.69	4040603	41820	0.62	3697228	34384[2]	**38102**	**37791**
Unit 2												

VG S FROM DOE

TOTAL 39459 TPY − UNIT 1 13383 TPY = 26076 TPY (UNIT 2)

$$\frac{26076\ \text{TON}}{\text{YR}} \times \frac{1.25}{\text{RATIO OF } \frac{24\text{-hr 90th \%}}{\text{AVG ANN}} \text{ 1997-2000 DATA}} \times \frac{\text{YR}}{8760\ \text{hr}} \times \frac{2000\ \text{lb}}{\text{TON}} = 7442\ \text{lb/hr (UNIT 2)}$$

VS. 5635 lb/hr ALLOWABLE

1 AP-42 emission factor of 30(S) is used for uncontrolled cyclone-fired lignite combustion (Table 1.7-1)
AP-42 emission factor of 16.8(S) is used for Subpart D boilers (Table 1.7-2)
Emission factor of 1.2 lb/mmBtu is used for units subject to NSPS at the time (40 CFR 60.43)

2 Acid Rain Database emissions report 23,771 TPY in 1980 for Minnkota Units 1 and 2.

BASELINE SOURCE COMPARISON (*Draft - do not cite or distribute*) - 06/04/01
Baseline emissions are based on annual emission inventory reports provided by ND for 1976-1977

Source	Baseline Emissions Comparison OPTION 1 Using Average Hourly Coal Feed Rate				Baseline Emissions Comparison OPTION 2 Using Ratio of Annual to 24-hr from 1999-2000 CEM data				Increment Consuming Emissions Comparison EPA proposal = 2-yr average @ 90%			
	24-hr ND [lb/hr]	24-hr Opt. 1 [lb/hr]	annual ND [TPY]	annual Opt. 1 [TPY]	24-hr ND [lb/hr]	24-hr Opt. 2 [lb/hr]	annual ND [TPY]	annual Opt. 2 [TPY]	24-hour ND [lb/hr]	24-hr EPA proposed [lb/hr]	annual ND [TPY]	annual EPA proposed [TPY]
Montana-Dakota Utilities Co. - Heskett Station												
Unit 1	858	463	1769	1768	858	no CEM data	1769	1768	0	no CEM data	0	0
Unit 2	2014	1078	4187	4186	2014	no CEM data	4187	4186	0	no CEM data	0	0
Minnkota Power Cooperative - M.R. Young Station												
Unit 1	7500	3310	13109	13383	7500	3972	13109	13383	0	1615	0	0
Unit 2[1]	5635	no data	24682	no data	5635	no data	24682	no data	0	no data	0	no data
Great River Energy - Stanton Station												
Unit 1[2]	4416	no data	8018	no data	4416	no data	8018	no data	1369	no data	0	no data
Unit 10	Unit 10 was constructed after the minor source baseline date (12/19/77). All emissions are increment consuming.											
Basin Electric Power Cooperative - Leland Olds												
Unit 1	4774	2210	8551	8551	4774	2499	8551	8551	2156	1895	2715	8282
Unit 2	9968	3898	13094	13094	9968	4305	13094	13094	3700	10179	10648	17852
TOTAL [TPY]	**64570 TPY**	**26753 TPY**	**21645 TPY**	**21645 TPY**	**64570 TPY**	**29802 TPY**	**21645 TPY**	**21645 TPY**	**25649 TPY**	**52884 TPY**	**13363 TPY**	**26134 TPY**

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1 Unit 2 had only been operating 9 months as of the minor source baseline date (12/19/77) and those 9 months were not considered representative of actual operation. Therefore, either allowable emissions or a more representative 2-year period (19??-19??) will be used to calculate baseline emissions. See 45 FR 52714, col 3.

2 We did not receive annual emission inventory reports for either unit at Great River Energy's Stanton Station.

ND SO_2 BASELINE EMISSIONS - based on AP-42 and annual emission inventory reports provided by ND for 1977-1978
SO_2 minor source baseline date for Montana Class I areas = March 26, 1979 *M. Williams 01/04/02*

Source	Date	Controls	Basis	Emission Factor[1] [lb_{SO2}/ton_{coal}]	1977 Actual Emissions				1978 Actual Emissions				**Baseline Emissions**	
					avg. S [%]	avg. coal heat content [Btu/lb]	coal burned [TPY]	annual emissions [TPY]	avg. S [%]	avg. coal heat content [Btu/lb]	coal burned [TPY]	annual emissions [TPY]	**annual [TPY]**	**24-hr[2] [lb/hr]**
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